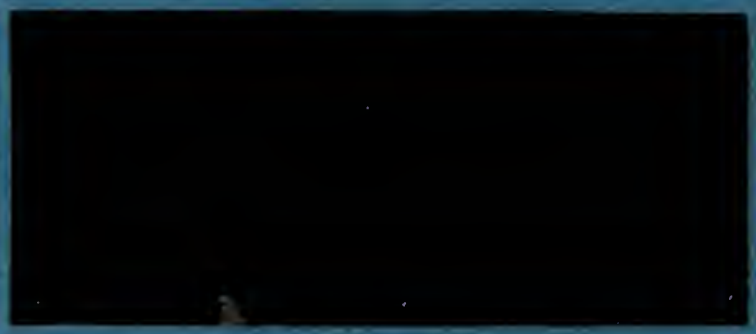
EVALUATION OF THE ROLE OF SYSTEMS ANALYSIS IN THE DEFENSE DESIGN FOR DECISION MAKING

By Cletus W. Bodart

June 1967



EVALUATION OF THE ROLE OF SYSTEMS ANALYSIS IN THE DEFENSE DESIGN FOR DECISION MAKING

By Cletus W. Bodart

June 1967

EVALUATION OF THE ROLE OF SYSTEMS ANALYSIS IN THE DEFENSE DESIGN FOR DECISION MAKING

by

Cletus W. Bodart

B.S., 1954, University of Wisconsin

A thesis submitted to the Faculty of the School of Government and Business Administration of The George Washington University in partial satisfaction of the requirements for the degree of Master of Business Administration

June, 1967

Thesis directed by

Chei-Min Paik, D.B.A.

Assistant Professor of Accounting

TABLE OF CONTENTS

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

Atmosphere for Defense Decisions

Secretary of Defense Robert S. McNamara has aggressively pursued the role of the Secretary of Defense as he sees it. His definition of this role is not merely that of an administrator or "judge" of the decisions being made in the Department of Defense. In his own words, he denies the passive role.

> My own strong belief is a manager should be an aggressive leader, an active leader, asking questions, suggesting alternatives, proposing objectives . . .[1]

There is a chain of assumptions necessary to an understanding of the requirements for this kind of aggressive, active leadership. First, it requires an unprecedented centralization of decision making. This, in turn, means that a substantial amount of information, in the form and timeliness necessary to facilitate decisions, be provided to the Secretary.

The budget provided substantial information concerning the activities of the military services, but it was not in such form that major decisions regarding the possible trade-offs between the service programs could be observed. Stated another way:

---

[1] David Seligman, "McNamara's Management Revolution," Fortune, July, 1965, p. 119.

> The relationship between resources shown in the budget and military missions was not explicit . . . the long-term implications of budget decisions were not easily or clearly seen. [1]

There existed a dichotomy between the long-range planning of the military services, which dealt in outputs, and the short-range budget, dealing in inputs.

The first step toward providing Mr. McNamara the decision-making ability he desired was to span the gap between the long-range military plans prepared by the military planning organizations and the budgets prepared by the individual military Comptroller organizations which were essentially uncoordinated. Mr. McNamara and Mr. Hitch attempted to span this gap by establishing the programming process to precede budget formulation. [2]

This was a start in the systematic structuring of problems in terms of objectives, needs, interrelationships, and proportion of major Defense Department programs. Just having this basic structure was a giant step in the design for an atmosphere of decision making. Something more was required, however, as one of the Deputy Assistant Secretaries of Defense wrote:

> The bewildering array of entirely feasible alternative forces which our scientists can offer today has enormously complicated our problems of choice. There is hardly a military task which cannot be accomplished in a multitude of ways. . . .
>
> We cannot hedge against this array of possibilities by simply buying them all. To attempt to do so would only lead to squandering

---

[1] Bert Mogin, Office of the Secretary of Defense (Comptroller), Speech before the Navy Financial Management Students, The George Washington University, November 2, 1966.

[2] Ibid.

of resources on partially completed programs. Choices have to be made, and the aim of systems analysis is to help in making these choices correctly. [1]

Purpose and Scope

The purpose of this paper is to establish that there is a design for knowledgeable decision making in the Department of Defense and to describe and evaluate the role of systems analysis in the Office of the Secretary of Defense as it relates to that design. Some of the questions this paper hopes to answer are these:

1. What is the modern design for defense decision making?

2. How does systems analysis fit into the design?

3. What is systems analysis and how can the process as applied in the Office of the Secretary of Defense be defined and described?

4. What are the recognized benefits and limitations of the systems analysis approach?

5. How does the application of the systems analysis approach in the Office of the Secretary of Defense affect the Navy?

This paper is organized, first, to describe in broad terms the framework within which the Secretary of Defense makes decisions concerning force level. Within this framework, the importance and reliance placed on systems analysis will be discussed. The nature of the dialogue between the

---

[1] Russell Murray, Deputy Assistant Secretary of Defense for General Purpose Programs (Systems Analysis), "Systems Analysis and Cost Effectiveness," Defense Industry Bulletin, II, No. 9 (September, 1966), 1.

services and the Office of the Secretary of Defense regarding systems analysis actions and determinations will be described using both formal and informal lines of communication. Systems analysis will be discussed as an applied economic approach to decision making with its recognized limitations. Finally, the application of systems analysis to Navy programs will be discussed with its resultant implications.

Significance of the Study

The primary significance of this paper is to gain and demonstrate an understanding of the approach and application of systems analysis. Since the Secretary of Defense decisions regarding force structures and levels within the services have an impact on all defense activity, it has become vital for all Naval Officers as well as other Department of Defense employees to have an appreciation for the decision process. The intention of this paper is to shed some small amount of light on at least part of the decision procedure which has heretofore been viewed with awe, if not as a complete mystery, by many members of the Department.[1]

Some recent actions taken in the Federal Government Administration reveal the attitude of the President and Congress concerning their acceptance of the decision-making processes of the Department of Defense. The President in October, 1965, for example, directed the introduction of an integrated Planning-Programming-Budgeting System in all agencies of the

---

[1] Personal interview with Captain Charles Woods, USN, Office of the Chief of Naval Operations, Code OP 96 (Systems Analysis), December 8 and 9, 1966.

Executive Branch. In describing the need for such a system, the Bureau of the Budget explained that with present practices:

> Objectives of agency programs and activities have too often not been specified with enough clarity and concreteness; accomplishments have not always been specified concretely; alternatives have been insufficiently presented for consideration by top management; in a number of cases the future year costs of present decisions have not been laid out systematically enough; and formalized planning and systems analysis have had too little effect on budget decisions.[1]

Also, in October, 1965, Senator Gaylord Nelson of Wisconsin introduced a bill entitled the "Scientific Manpower Utilization Act," which would authorize the spending of $125 million in helping states and universities to apply systems analysis to urgent problems. In October, 1966, Senator Nelson, for the Congressional Record, welcomed the support his bill was receiving and took the opportunity to further emphasize its importance:

> The systems approach to problem solving has attracted considerable attention in the past several years. Born out of the defense and space efforts, this approach is now finding application in the civilian sector. The rising problems of transportation, environmental pollution, crime and regional and urban development lend themselves to the ever-improving tools and techniques of systems analysis, automatic data processing, systems engineering and operations research. . . . The unrealized potential of the systems approach at state and local levels convinces me that congressional action is needed soon.[2]

Within the Department of Defense, McNamara's decision methods have been spreading rapidly, from the Secretary's Office to the services. As Seligman points out in "McNamara's Management Revolution," the

---

[1] Executive Office of the President, Bureau of the Budget, Bulletin No. 66-3, to the Heads of Executive Departments and Establishments, October 12, 1965.

[2] U.S., Congressional Record, 89th Cong., 2d Sess., October 12, 1966, pp. 27300-27301.

services "have been actively developing systems-analysis capabilities of their own, so that, to caricature the situation only slightly, they will be able to slug it out with Enthoven's boys on more even terms."[1] The Navy, recognizing the need for a central repository of systems-analysis talent, has within the last eight months established a Systems Analysis Division in the Office of the Chief of Naval Operations. It was created to provide the Chief of Naval Operations with "the capability to evaluate the relative effectiveness of alternatives in programs and program proposals, and thereby to assist in the decision-making process."[2] The main problem faced by this office thus far is to "sell" the approach to the force sponsors within the Office of the Chief of Naval Operations. It must be made clear to the force sponsors that their positions during the Joint Chiefs of Staff and Office of the Secretary of Defense reviews will be strengthened rather than weakened if their programs are presented with alternative courses of action showing sacrifice risk.[3]

It is therefore obvious that an evaluation of the systems analysis approach within the design for decision making of the Department of Defense is both important and timely.

---

[1]Seligman, op. cit., p. 250.

[2]Charter for Systems Analysis Group, Office of the Chief of Naval Operations.

[3]Personal interview with LCdr. Shelby Clark, SC, USN, OP-96 (Systems Analysis), Office of the Chief of Naval Operations, December 9, 1966.

Sources of Information

While there is a considerable amount of literature devoted to decision making in the Department of Defense, most of the books pre-date the "management revolution" of the 1960's and, in fact, appear to be blueprints for the present atmosphere. To absorb impressions and reactions to present processes of decision making, it became necessary to turn to more current periodicals and even these were theoretical in nature or at least less than objective in their interpretations. The remaining sources of data were found in studies such as those conducted by the RAND Corporation; and most current information was gathered through extensive study of instructions and notices within the Office of the Secretary of Defense and the Navy; lectures by Department of Defense officials currently working in the area; and, finally, numerous personal interviews with both military and civilian personnel in the Office of the Secretary of Defense and the Office of the Chief of Naval Operations.

CHAPTER II

MODERN DESIGN FOR DEFENSE DECISION MAKING

Evolution

When President Kennedy first asked Mr. McNamara to accept appointment as the Secretary of Defense, three basic questions came to McNamara's mind:

> What was the climate in the Pentagon? What kind of a job was being Secretary of Defense? Could I--or for that matter could anyone--truly manage the Department of Defense?[1]

The Department of Defense has, in fact, progressed through various phases of strengthening the authority of the Secretary, but this progression has done little to provide him with the tools for making decision. The National Security Act of 1947 established the Secretary of Defense and authorized him to establish "general" policies and programs and to exercise "general" direction, authority, and control of the military services.[2]

Prior to World War II, there was much opposition to unification in any manner of the services. During that war, however, the combined land/sea/air operations played such a vital role that the need for unification of

---

[1] Robert S. McNamara, "Managing the Department of Defense," Civil Service Journal, IV, No. 4 (April-June, 1964), 1.

[2] National Security Act of 1947, P.L. 253, 80th Cong., 1st Sess., July 26, 1947 (61 Stat. 495).

planning and operations was recognized. President Truman, in 1945, made a strong recommendation to Congress for the establishment of a single Department of National Defense. Mr. Charles J. Hitch (who was later to become Mr. McNamara's first Assistant Secretary of Defense, Comptroller) quoted from Mr. Truman's own words to describe and analyze the essence of the President's proposal for unification:

> In order to achieve this purpose, he felt that "we should have integrated strategic plans and a unified military program and budget." In this connection he stressed a principle that is only now being generally accepted in the Defense Department, namely, and I use his words, that "strategy, program, and budget are all aspects of the same basic decisions."[1]

The National Security Act of 1947 fell far short of these purposes. In 1949, through recommendations by the first Secretary of Defense, James V. Forrestal, the Hoover Commission, and others, amendments were made to that Act in order to bring the Secretary of Defense the powers to exercise his authority over the armed services and thus established the paramount position of the Secretary of Defense as the principal assistant to the President on defense matters. At the same time, the Army, Navy, and Air Force relinquished their status as Executive Departments. The Office of the Secretary of Defense was to include a Deputy and three Assistant Secretaries. A Chairmanship of the Joint Chiefs of Staff was created. Additionally, Title IV was added to the Act to provide for the office

---

[1]Charles J. Hitch, "Decision Making in the Department of Defense," from the H. Rowan Gaither Lectures in Systems Sciences, at the University of California, April 5-9, 1965, p. 18.

of the Assistant Secretary of Defense, Comptroller, and the uniformity of budget and fiscal procedures throughout the Department.[1]

In 1953, the Office of the Secretary of Defense was further strengthened to provide that no military function was to be carried out independently of the Secretary of Defense and the office was expanded from three to nine Assistant Secretaries.[2] Again in 1958, a reorganization took the military departments, which had been acting as executive agents in the operational control of the unified commands, out of the chain of command so that the line now runs from the President to the Secretary of Defense, through the Joint Chiefs of Staff to the unified commands.[3]

As President Eisenhower pointed out in his special message to Congress on the 1958 reorganization:

> Complete unity in our strategic planning and basic operational direction /is a vital necessity/. It is therefore mandatory that the initiative for this planning and direction rest not with the separate services, but directly with the Secretary of Defense and his operational advisers, the Joint Chiefs of Staff, assisted by such staff organization as they deem necessary.[4]

---

[1] National Security Act Amendments of 1949, P.L. 216, 81st Cong., 1st Sess., August 10, 1949 (63 Stat. 578).

[2] Reorganization Plan No. 6 of 1953 (67 Stat. 638).

[3] Department of Defense Reorganization Act of 1958, P.L. 85-599, 85th Cong., 2d Sess., August 6, 1958 (72 Stat. 514).

[4] Hitch, "Decision Making in the Department of Defense," op. cit., p. 22.

It becomes clear from the foregoing brief historical analysis that, since World War II, the design for centralized decision making in the Office of the Secretary of Defense has been the concern and direction of Presidents and the Congress. All of these actions were not met with great enthusiasm by the military service departments since it became apparent even then that they were being stripped little by little of their power to operate in a unilateral manner.

Responsibility versus Ability

The Office of the Secretary of Defense had indeed been given the responsibility and authority to direct the affairs of the military departments. Mr. McNamara, in an attempt to answer some of his questions about the role of the Secretary of Defense, talked to his predecessor, Thomas S. Gates, Jr., who showed him a committee report that had been published in 1953 concerning the powers of that office. Mr. Nelson Rockefeller, who headed the committee, included the following in his report to Congress:

> The Secretary of Defense has by statute full and complete authority over the Department of Defense, all its agencies, subdivisions and personnel subject only to the President. . . . There are no separately administered preserves in the Department of Defense. . . . The Secretaries of the Military Departments, the Joint Chiefs of Staff, all officers and other personnel are under the Secretary of Defense . . . His power extends to all affairs and activities of the Department of Defense. [1]

The responsibility for control was therefore very clear, but the sheer magnitude of the task lends credence to Mr. McNamara's question as

---

[1] McNamara, op. cit., p. 1.

to whether anyone could really manage the Defense Department.

There is a force today of nearly three million military personnel on active duty, supported by over one million civilians and backed up by one million military reserve personnel. With a budget of over $60 billion, and with a vast scope of activity touching virtually every segment of the American economy, the decisions made in the areas of procurement and force structures are vitally important. How, one might ask, could any man, or group of men, ever manage such a vast aggregation of men, equipment, installations, and activities all over the world? To be fully effective, however, the defense effort must be managed on a uniform basis in planning as well as in the conduct of combat operations. President Eisenhower, in his message to the Congress on the reorganization of 1958, stressed this point of unity in plans:

> No military task is of greater importance than the development of strategic plans which relate our revolutionary new weapons and force deployments to national security objectives. Genuine unity is indispensable at this starting point. No amount of subsequent coordination can eliminate duplication or doctrinal conflicts which are intruded into the first shaping of military programs. [1]

When Mr. McNamara arrived at the Pentagon in 1961, he found that military planning and budgeting were being performed independently. Planning, the responsibility of the Joint Chiefs of Staff (JCS) and the military departments, was accomplished in terms of military forces and weapon systems and was projected over periods of from five to ten years. Budgeting,

---

[1] Hitch, "Decision Making in the Department of Defense," op. cit., p. 22.

however, was done in terms of functional categories such as "military personnel," and line items such as "travel" and "pensions, annuities, and insurance claims," which were breakdowns of the functional categories.

This gap between military planning and budgeting has been held responsible for the so-called interservice "rivalry," the alleged strife which--it was charged by observers of the Pentagon scene during the 1950's--was costing the American taxpayers millions of dollars each year.[1] Budget preparation during that period was characterized by special pleading as each military service proceeded independently of the others in pushing its individual interests. Because of the lack of coordination between military planning and defense budgeting, each service was disposed to submit each and every worthwhile project as a budget request in the hope of increasing its share of the budget without regard to the plans being made in the other services. General Maxwell D. Taylor expressed this view in these words:

> The three services develop their forces more or less in isolation from each other, so that a force category such as strategic retaliatory force, which consists of contributions of both the Navy and the Air Force, is never viewed in the aggregate. . . . In other words, we look at our forces horizontally when we think of combat functions, but we view them vertically in developing the defense budget.[2]

Although previous legislation had, at the time of its passage, been called a "major overhaul of the entire DOD budget and fiscal system,"[3] it

---

[1] "What Tying Dollars to Military Decisions Means to Defense Management," Armed Forces Management, IX, November 1962, p. 87.

[2] Maxwell D. Taylor, The Uncertain Trumpet (New York: Harper and Bros., 1959), p. 123.

[3] "What Tying Dollars to Military Decisions Means . . .," op. cit., p. 87.

did not bridge the gap between planning and the budget. It still remained for Mr. McNamara to accomplish the bridging operation. The shortcomings of this split between planning and budgeting had not gone unnoticed in Congress. In two letters to the Secretary of Defense in 1959, Representative George Mahon, then Chairman of the House Defense Appropriations Subcommittee, stressed the importance of looking at the Defense programs and budget in terms of military missions by grouping programs and their cost by mission. He also called for "more useful information and for a practical means of relating costs to missions."[1]

Mr. McNamara sought an alternative to the system so that he could allocate funds to the services on the basis of the overall needs of national security and thus provide the country with a balanced military posture. He called for a study of defense budgeting which would lead to this new approach --whose main goal would be the forging of a link between military planning and defense budgeting.

The blueprint for the new approach was already in existence in a book entitled The Economics of Defense in the Nuclear Age, by Charles J. Hitch and Roland N. McKean. Mr. Hitch, who was Mr. McNamara's Assistant Secretary of Defense (Comptroller), offers considerable insight into his concept of defense budgeting prior to his assuming actual responsibilities in this area. The authors pointed out that defense plans and decisions

---

[1]Hitch, "Decision Making in the Department of Defense," op. cit., p. 33.

cannot be made on the basis of cost only or need only. Indeed, the right question to ask is: How much is needed for defense more than is needed for other purposes?[1]

The first step they suggested as a means of improving the choice of program sizes was to put budget figures into categories that more clearly correspond to end-product missions. This would enable officials to make better decisions concerning their importance to the nature of these missions. The budget, designed to show the approximate costs of such missions, would have to cross interdepartmental lines. Three broad program categories were proposed: (1) deterrence or fighting of all-out war; (2) deterrence or fighting of limited war; and (3) research and development.[2]

They also pointed out that the decision makers would like to know the extra or incremental program costs of the alternatives being considered. In essence, Hitch and McKean proposed a format that embraced an integrated Department of Defense budget. Within such a budget, the programs of individual services would be grouped with those of other services and displayed in the mission category toward which those particular forces are directed. Forces and costs were to be projected some years in the future, and the total mission could be analyzed by comparing costs and benefits of the elements making up the mission force.[3]

---

[1] Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age (Cambridge: Harvard University Press, 1960), pp. 47-48.

[2] Ibid., pp. 54-57.

[3] Ibid., p. 57.

Both Mr. McNamara and Mr. Hitch were convinced that the financial management system must provide the data needed by top defense management to make the really crucial decisions, particularly on the major forces and weapon systems needed to carry out the principal missions of the Defense establishment.

It was noted that, although unification had been achieved in form, beginning with the National Security Act of 1947,

> . . . It was not until 1961 that the full powers of the Secretary of Defense to run the Department on a unified basis . . . were actually used. . . . This situation existed principally because earlier Secretaries of Defense lacked the necessary tools to do so.[1]

The "tool" provided to Mr. McNamara was a new function, which he called programming, and which was incorporated in the financial management system. "Since the military planning function and the budget function were already well established, the role of programming was to provide a bridge between the two."[2]

The New System

One distinction that should be made is that the system or process set up by Mr. Hitch had as its ultimate objective the facilitation of the decision-making process in the Department of Defense. Establishment of this system gave recognition to the fact that the great technical complexity

---

[1] Hitch, "Decision Making in the Defense Department," op. cit., p. 25.

[2] Ibid., p. 37.

of modern weapon systems, the lengthy developmental and procureme devastating combat power, and enormous costs place a tremendous prem·um on the selection of weapon systems for future tasks and missions. Choice in these areas are the key decisions around which the defense program and budget are built.[1] To make these decisions, the Secretary of Defense needs to know the cost of each of the systems in relation to its military effectiveness. These costs need to be evaluated for a period longer than just one budget year--ideally over the entire life cycle of the system, including both the initial investment cost and annual operating costs. He also needs to know what the effectiveness of each system is in relation to its mission and the alternative weapon systems available to perform that mission both now and in the future.[2]

Seven broad goals were established for the programming system, and since this system is regarded as a tie-in between planning and budgeting, these are in essence goals of the planning-programming-budgeting system:

1. Planning oriented around major missions. --The system is primarily oriented around military forces classified in terms of independent or related missions, as opposed to grouping the military forces of the services separately. These mission-oriented military forces

---

[1]Charles J. Hitch,"The Defense Budget as a Management Tool," an address before the Annual Conference of the Armed Forces Management Association, Shoreham Hotel, Washington, D.C., March 1, 1963.

[2]Charles J. Hitch, "Remarks before the American Society of Military Comptrollers," The Pentagon, Washington, D.C., September 21, 1961.

constitute the output of the defense program, and therefore are the primary focus for decision making.

2. Ability to relate resource inputs to military output. --While each proposed force structure has its cost in dollar terms, an estimate of time-phased requirements for major resources must nevertheless be made in terms of physical units, such as manpower, items of equipment, and facilities. The system must be capable of providing both financial and non-financial estimates of resource inputs required to obtain a specified military output.

3. Coordination of long-range planning with budgeting. --Long-range planning and programming decisions must be compatible with budgets and funding decisions. The programming system must provide a means for changing approved programs for compatibility purposes, if a need for a revision of programs is recognized during the budget review process.

4. Continuous appraisal of programs. --An unnecessary contraction of decision making into a very short period of time would result from tying defense planning to an arbitrary calendar period. It would also result in increased time to respond to changing military needs. While budgeting and funding are necessarily geared to an annual cycle, this does not preclude continuous appraisal of long-range programs.

5. Progress reporting. --Control must be exercised through a series of progress reports, and significant deviations from approved

plans can be detected at an early enough time so that corrective action can be taken.

6. Ability to make cost-effectiveness studies. --A routine capability is required for making cost-effectiveness studies of alternative force structures.

7. Integration of OSD information systems. --In view of the fact that the programming system imposes heavy requirements on information from the services, other reporting systems having similar requirements must be revised to avoid duplications. The end objective should be the development of an integrated OSD management system.[1]

Mr. Bert Mogin, from the Office of the Assistant Secretary of Defense (Comptroller), added to this list, or perhaps summarized, when he stated that one of the objectives was "to establish a single channel for major decisions on Defense programs."[2] He goes on to explain that this has not been completely accomplished because Mr. McNamara must make some decisions outside the programming systems, but that the Secretary does use the programming system "as his principal vehicle for decision making."[3]

---

[1]U. S. Department of Defense, Study Report on the Programming System for the Office of the Secretary of Defense (Washington: Office of the Assistant Secretary of Defense (Comptroller), June 25, 1962), pp. I-2 and I-3.

[2]Mogin, op. cit., p. 10.

[3]Ibid.

The Five-Year Defense Plan is the foundation of the Department of Defense Programming System and as such is the blueprint for the future. Basically, it is the summation of all approved programs of all Department of Defense components. It establishes for each military service an approved force structure for eight years into the future and resource levels for five years.[1] By relating the resources to forces, or, in other words, inputs to outputs, it provides the Secretary of Defense with two major planning dimensions. By using one, he can aggregate the military forces required to counter enemy threats. By using the other, he can concurrently allocate available resources toward meeting the requirements for providing and supporting these military forces.

The elements of the Five-Year Defense Plan can be described in terms of three major building blocks, as follows:

1. Major programs represent aggregations of similar military missions and supporting functions of the military services into eight broad functional classifications:

Program I - Strategic Retaliatory Forces

Program II - Continental Air and Missile Defense Forces

Program III - General Purpose Forces

Program IV - Airlift and Sealift Forces

Program V - Reserve and Guard Forces

---

[1] The Navy Programming Manual, Office of the Chief of Naval Operations (OPNAV 90P-1, June11 , 1965, with changes), p. I-3-1.

The Two-Term Problem [illegible] of the Department of Defense Procurement [illegible] Banking, it is the responsibility [illegible] of Defense procurement. [illegible] lower effective [illegible] years. [illegible] By relating the [illegible] methods, it provides [illegible] cost. By using [illegible] complex many firms. [illegible] available resources [illegible] supporting [illegible]

The elements [illegible] terms of [illegible]

1. [illegible] maximum [illegible] maximize [illegible] [illegible]

Program I - [illegible]

Program II - [illegible]

Program III - [illegible]

Program IV - [illegible]

Program V - [illegible]

[illegible] [illegible] [illegible] [

Program VI - Research and Development

Program VII - General Support

Program VIII - Military Assistance Program

Each major program is a combination of program elements designed to accomplish a definite objective or plan that is specific as to the time-phasing of what is to be done and as to the means for doing it.

2. Program elements are the smallest units of military output controlled at the Department of Defense level. It is an integrated activity; an identifiable military capability; a force, support activity, research activity, etc., comprising a combination of men, equipment, and facilities."[1] The "Fleet Ballistic Missile System," "Attack Carriers, FORRESTAL Class," and Recruit Training, Navy" are examples of program elements. All program elements taken together constitute the complete planned output of the Defense Department. Since each DOD activity falls within one and only one program element, the total of all the elements taken together constitutes the total planned output of the Defense Department.

Major program decisions are made in terms of program elements, therefore the programming system requires costing by program

---

[1] U.S. Department of Defense, DOD Programming System (DOD Directive 7045.1), October 30, 1964, p. 2.

elements, with the cost divided into three cost categories: Research and Development, Investment, and Operating.

3. Resource categories include either unique types of resources or homogeneous groupings of related resources. There are four major types of resource categories: (1) items of equipment, (2) manpower, (3) military construction, and (4) the functions and activities financed under Operation and Maintenance appropriations. Just as in the case of program elements, the sum of all resource categories equals total resources input since every resource input falls within one and only one resource category.[1]

The Five-Year Defense Plan, as its foundation, and the planning-programming-budgeting structure provide definition of areas of activity within which alternative courses of action can be treated and decisions made with some knowledge of the effects of those decisions on our national defense posture.

The major elements of the programming system are: a program structure of objectives in terms of missions and forces as described above; the analytical comparison of alternative means of achieving the objective; a continually updated Five-Year Defense Plan; and related year-round decision making on new programs and changes.[2] The implementation of this system

---

[1] The Navy Programming Manual, op. cit., p. I-3-1.

[2] David Novick, Program Budgeting: Program Analysis and the Federal Budget (Washington: U.S. Government Printing Office, 1965), p. 57. A RAND Corporation publication.

makes it possible to incorporate the three interdependent and interrelated approaches toward the achievement of efficiencies in military decisions as described by Hitch and McKean:

> The improvement of institutional arrangements within the government to promote efficiency . . . improve budgeting and accounting methods, attempt to provide more appropriate incentives, and reorganize the apparatus of decision making. . . .
>
> Increased reliance on systematic quantitative analysis to determine the most efficient alternative allocations and methods; . . .
>
> Increased recognition and awareness that military decisions, whether they specifically involve budgetary allocations or not are in one of their most important aspects economic decisions; and that unless the right questions are asked, the appropriate alternatives selected for comparison, and an economic criterion used for choosing the most efficient, military power and national security will suffer. [1]

---

[1] Hitch and McKean, op. cit., p. 107.

CHAPTER III

SYSTEMS ANALYSIS AND PLANNING, PROGRAMMING, AND BUDGETING

Definition and Role

The Program Budgeting system described in the preceding chapter and as viewed by the Secretary of Defense has become the framework, or the design, within which defense decisions are made. Mr. G. H. Fisher, in a presentation for a conference on program budgeting, makes the observation that in many cases people have tended to focus on the structural format of programming, neglecting the analytical parts of the system. This, he states, is a great error in emphasis. Many of the most important benefits of the programming system are not realized without establishing analytical activity "to generate and specify alternative future courses of action, to systematically explore the implications of the alternatives in terms of possible benefits and costs, and to present the results to the planning decision makers in such a way as to sharpen their intuition and judgment."[1]

Over-emphasis of the role of systems analysis can also be a great mistake. In no case should it be assumed that the systems analyst or the

---

[1]Gene H. Fisher, The World of Program Budgeting, A Presentation to a Conference on Program Budgeting and Cost Analysis, University of California at Los Angeles, June 2, 1966 (Santa Monica: RAND Corporation), p. 8.

results of the analysis will "make" the decision. Especially in the Department of Defense, the problems are too difficult, with too many intangible considerations that cannot be taken in account in an analytical process, at least not in a quantitative sense. For example, the political, psychological, and sociological considerations must bear influence on major decisions made in most areas of defense posture. The analytical process should therefore be significant in its application as it is directed toward assisting the decision maker in such a way that his intuition and judgment are better than they would be without the results of the analysis. Dr. Alain Enthoven, the Assistant Secretary of Defense (Systems Analysis), finding difficulty in the definition of the term "Systems Analysis," says:

> Where does this leave us? What is operations research or systems analysis at the Defense policy level all about? I think that it can best be described as a continuing dialogue between the policy maker and the systems analyst, in which the policy maker asks for alternative solutions to his problems, makes decisions to exclude some, and makes value judgments and policy decisions, while the analyst attempts to clarify the conceptual framework in which decisions must be made, to define alternative possible objectives and criteria, and to explore in as clear terms as possible (and quantitatively) the cost and effectiveness of alternative courses of action.
>
> The analyst at this level is not computing optimum solutions or making decisions. In fact, computation is not his most important contribution. And he is helping someone else to make decisions. His job is to ask and find answers to the questions: "What are we trying to do?" "What are the alternative ways of achieving it?" "What would they cost, and how effective would they be?" What does the decision maker need to know in order to make a choice?" And to collect and organize this information for those who are responsible for deciding what the Defense program ought to be. [1]

---

[1] Alain Enthoven, "Decision Theory and Systems Analysis," The Armed Forces Comptroller, IX, No. 1 (March, 1964), 39.

There are many definitions, or at least variations of definitions, of the term "systems analysis." Some believe, for example, that systems analysis is a form of operations research or a cost-effectiveness approach. Others feel that operations research and cost-effectiveness studies are a part of the systems analysis approach. As seen from the above, Dr. Enthoven relates that even he has trouble producing a good brief definition. It is possible, then, to assume that definition is of little relative importance. Prior to an evaluation of the systems analysis approach, however, it is necessary to see how the organization and operation of the Office of the Assistant Secretary of Defense (Systems Analysis) is accommodated by the Planning-Programming-Budgeting system.

Organization

The Assistant Secretary of Defense (Systems Analysis)--OASD(SA)--was established in September, 1965. Prior to this time systems analysis was a function of the Assistant Secretary of Defense (Comptroller) and Dr. Enthoven was designated as a Deputy Assistant Secretary. The charter for OASD(SA) prescribed certain responsibilities, functions, and authorities. The responsibilities are: (1) to review quantitative requirements, including forces, weapon systems, equipment, and personnel for the Secretary of Defense; (2) to assist the Secretary in the initiation, monitoring, guiding, and reviewing of requirements and cost-effectiveness studies; (3) to encourage, throughout the Department of Defense, the use of the best analytical

methods; and (4) to conduct special studies when directed by the Secretary. Authority was granted to communicate directly with heads of all DOD components; to issue instructions and directives; and to obtain such information, advice, and assistance from DOD components as he deems necessary.[1]

In order to carry out its responsibilities, the Office of the Assistant Secretary of Defense (Systems Analysis) is organized along mission lines coincident with the programs described in the discussion of the Planning-Programming-Budgeting system. The missions are divided into two basic areas, with a Deputy Assistant Secretary in charge of each. These two areas are Strategic Programs and General Purpose Programs, both of which are further divided into mission teams--e.g., Strategic Defense Team, Strategic Retaliatory Team--under Strategic Programs; and Army-Marine Corps Land Forces Team, Mobility and Transportation Team, under General Purpose Programs.

Although these are the major divisions, there is a division for Resource Analysis, subdivided into cost analysis and manpower analysis sections. The talent in these sections spend most of their time as temporary members of, or as advisors to, the mission-oriented teams mentioned above. There is also a division for analysis of the economic impact of recommended decisions, and one for command, control, communications, and intelligence. Presently, there is a special division reporting directly

---

[1]U.S. Department of Defense, Charter for the Assistant Secretary of Defense (Systems Analysis), DOD Directive 5141.1, September 17, 1965, pp. 1-4.

to Dr. Enthoven for matters pertaining to Southeast Asia Programs.[1]

The organization contains 140 professional people, of whom forty-nine are military, representing each of the military services. Less than half of the professionals have operations research or systems analysis backgrounds. They range from economists to engineers, and from aviators to supply specialists.

Operation

The formal operation of the Systems Analysis Office is interwoven with the DOD Planning-Programming-Budgeting cycle and can be described in relation to that cycle. It is also convenient to divide the type of analysis applied into two conceptual approaches: fixed-utility approach and fixed-budget approach.[2]

The fixed-utility approach is used during the programming phase of the cycle. The first step is to determine a specified level of utility to be attained in the accomplishment of some given objective. The analysis then attempts to determine that alternative (or feasible combination of alternatives) which is likely to achieve specified levels of utility at lowest cost. The fixed-budget approach adds one more constraint, that of specified limits of funds, and is used during the budgeting phase of the cycle. More will be developed on these approaches from an economic benefit-cost viewpoint in the next chapter. They are mentioned at this time to give perspective to

---

[1] Organization Chart of the Office of the Assistant Secretary of Defense (Systems Analysis), April, 1966.

[2] Fisher, op. cit., pp. 14-15.

to Dr. Dahlman for allowing [illegible] to [illegible] this [illegible].

The [illegible] [illegible] [illegible]

the analysis taking place during the annual programming-budgeting cycle.

Programming is a continuing exercise in updating and correcting the Five-Year Defense Plan and gaining approval for new programs from the Secretary of Defense. Because the procedure is continuing, one could start at any point during the calendar year to describe the interaction of systems analysis, but for convenience of description it is well to begin with the publication of the Plan on January 1 of each year. At this point, each of the services, through their individual Secretaries, submits a list of recommendations for Major Force Oriented Issues (MFOI). These are reviewed by the OASD(SA) and recommendations are made to the Secretary who, upon review, publishes a list of all major force-oriented issues requiring resolution. No attempt is made at this time to resolve the issues.[1]

This procedure has not been fully tested since its inception in the calendar year 1966 cycle. McKinsey and Company, Inc., a leading management consulting firm, is presently involved in a review of their recommendations. The service Secretaries this year submitted a rather comprehensive list of relatively specific and major issues which they felt required resolution. The Secretary of Defense approved list of MFOI's was more comprehensive than any of those submitted by the individual service Secretaries, but each of the issues appeared very broad in scope and not as

---

[1]Memorandum to the Assistant Secretary of Defense (Comptroller), from McKinsey and Company, Inc., January 5, 1966, p. 8.

restrictive as might have been hoped for in the McKinsey recommendations.[1]

The next step is the receipt of the Joint Strategic Objectives Plan (JSOP), which is prepared by the Joint Chiefs of Staff with the assistance of the planners in the military departments. Until 1966, the JSOP was a "wishing list" for each of the military services and served very little purpose in OSD because it was too broad in nature and merely stated needs with no alternative courses of action.

Through the cajoling of OASD(SA), the 1966 JSOP specified manpower and cost considerations and provided some alternative courses of action costed out. It also provided some estimation of risk implied in each alternative.[2] Admittedly, this was a rough attempt at providing the Secretary of Defense with a document which could be useful to him and his staff of analysts, and it is hoped that the 1967 JSOP will be much better. With some further refinements it is hoped that the JSOP will become the basis for future force decisions.

From April to sometime in June or early July, the OASD(SA) staff makes detailed analyses of the current FYDP, JSOP, and special studies and their interrelationships with the Major Force Oriented Issues and other current areas of importance and prepares the initial draft of the Presidential Memoranda. This represents one of the principal products of OASD(SA);

---

[1]U.S. Department of the Navy, files of the Office of Chief of Naval Operations, Systems Analysis (Code OP 96), March, 1967.

[2]Herbert Anderson, Capt., USN, Office of the Chief of Naval Operations (Code OP 90B), Speech before the Navy Financial Management students, The George Washington University, November 30, 1966.

and the process of analysis, which will be described in detail later in this paper, becomes daily routine for the analysts.[1]

A brief explanation of the systems analysis process is necessary at this time to show how the OASD(SA) aids Mr. McNamara in his decision on Presidential Memoranda. The first step is to define or redefine objectives. For example, if a broad objective of the Navy is "control of the sea," the analyst must decide on some measurable goal within the broad objective, the accomplishment of which he can use in his analysis. One of the reasons for control of the sea is to insure X tons of supplies per day to some war zone. Within this definition, effectiveness can be measured--X tons delivered.

The next step is to identify the feasible alternative means of accomplishing the objective. This year it is hoped that the analyst could refer to the JSOP to determine the JCS alternatives. As a seeker of alternatives himself, he may generate some new ones. For example, he may weigh the advantages, disadvantages, and costs of airlift, sealift, and prepositioning of material close to potential "hot spots." He may even, at this time, question or recast the objective, Y tons rather than X tons, if the cost of all alternatives exceeds reasonable attainable capability or expenditure.

The next step is to rank the alternatives in order of their cost/effectiveness ratios. It is important here to point out that the ranking is

---

[1]Personal interview with LCdr. M. Staser Holcomb, USN, Analyst, Office of the Assistant Secretary of Defense (Systems Analysis), November 30, 1966.

not done on cost alone. It is also important to realize that maximum effectiveness at any cost is impractical. The approach used is a time-phased cost and effectiveness analysis extending at least through the five-year span of the Five-Year Defense Plan. The cost figures used are original acquisition costs plus reasonable expectations of recurring cost. Effectiveness is measured by approximations of the ability to accomplish the objective--in the above example, deliver X tons.

Presented with this kind of analysis, Mr. McNamara must then integrate cost effectiveness with other judgments--economic, political, military, operational, and technical--in order to make his decision. These decisions then become the Initial Draft Presidential Memoranda (IDPM). These documents go not only to the President, but to the military services showing the areas where changes or continuations of the Five-Year Defense Plan have been tentatively decided on.

These memoranda are the primary tools for the Secretary of Defense to solicit comments from the military services concerning conflict between their plans and his. They are very general in nature and require detailed Program Change Requests (PCR's) from the services showing their interpretation of the requirements to carry out the provisions of the IDPM. There are really three types of documents required at this time from the services: (1) detailed Program Change Requests to implement the decision as outlined in the entire IDPM; (2) reclama for the elements of the IDPM

with which the service takes exception; and (3) detailed Program Change Requests to implement the position taken in the reclama.

The services have thirty days from issuance of the Draft Presidential Memoranda in which to prepare detailed Program Change Requests required to implement the decisions into the Five-Year Defense Plan, or to reclama the decision outlined in the DPM. During July and August, the service and JCS comments are received and a process similar to that described above is applied to any new data provided by the services. By August 31, all Program Change Requests are due in OASD(SA) whether they are implementations of the DPM or recommendations based on the service reclama. The PCR's, as implied earlier, are very detailed, showing manpower and other resource requirements necessary to accomplish the proposed changes in the Five-Year Defense Plan.

The OSD systems analysts again subject these proposals to the detailed analysis shown above and make recommendations to the Secretary with a ranking of alternatives. During the months of August and September, the Secretary of Defense returns his Program Change decisions to the services for inclusion in their budgets.

Meanwhile, the Final Draft Presidential Memoranda are being prepared, incorporating the service positions and the interim decisions made by Mr. McNamara on the service reclamas and the PCR's. These memoranda are scheduled for publication by October 1 and contain a section showing three positions, as follows: (1) the "old" position as described in

the updated Five-Year Defense Plan, which was published on January 1; (2) the current decision of the Secretary of Defense on the proposal; and (3) the service/JCS position on the proposal. The services again have an opportunity for reclama if any new facts or bits of information have been found that could bear on the decision. A four-day limit is placed on the submission of such a reclama.

During October and November, budget reviews are held with the services and OASD (Comptroller). During these reviews, a representative from the Office of Systems Analysis is present.

It is at this point that a dichotomy develops. Mr. McNamara has provided guidance to the Comptroller on the limits of the Defense Budget which cannot be exceeded. This means that he could on the one hand be approving a service program through the programming phase, and on the other disallow the program through fund constraints in the budget phase.[1]

It is at this time that the concept of analysis changes from the fixed-utility approach to the fixed-budget approach. For the systems analyst, this

---

[1] M. Stacer Holcomb, LCdr, USN, Analyst, Office of the Assistant Secretary of Defense (Systems Analysis), Speech before the Navy Financial Management students, The George Washington University, December 14, 1966. Most of the materials covering the timetable of events and elements of systems analysis and the programming-budgeting system were accumulated during the speech, but were supplemented by personal interviews with LCdr. Holcomb and with Captain Charles Woods, USN; Cdr. Wayne Hughes, USN; LCdr. Shelby Clark, SC, USN; and LCdr. Jack Haregrove, USN, Office of the Chief of Naval Operations (Code OP 96), December 8 and 9, 1966.

means adding one more constraint: available funds. Given a "specified budget level to be used in the attainment of some objective, the analyst attempts to determine the alternative (or feasible combination of alternatives) which is likely to produce the highest utility for the given budget level."[1] He must again review the alternatives and objectives previously considered in the fixed-utility analysis with the added constraint of a fixed amount of money rather than "lowest possible cost."

It is interesting to note that the analyst who had been so "hard nosed" in the programming phase concerning costs and justifications now becomes the program's staunchest supporter when faced with the budget limitation and becomes just as "hard nosed" about accepting something less than the previously chosen alternative.[2]

This completes the yearly cycle and, with publication of the new updated Five-Year Defense Plan, the next year's cycle begins.

This, then, is the formal structure of the PPBS within which systems analysis plays its part. In the "continuing dialogue" that Dr. Enthoven refers to, there are many informal communications between the analysts and the program sponsors from the services which take place within the structure. For example, knowing that the Initial Draft Presidential Memoranda are critical to the future programs of the DOD, each military service submits information to the analysts working up the DPM's concerning its

---

[1] Fisher, op. cit., p. 15.

[2] Holcomb, op. cit.

special interest. This information can be in the form of special studies, either internal or contract studies, and, in the case of the Navy, "Program Objectives" (PO), giving force level objectives approved by the Secretary. For the Navy, these represent the level to which the Secretary of the Navy supports the objectives established by the Chief of Naval Operations and the Commandant of the Marine Corps in the JSOP.[1] These documents highlight for the analyst, and provide in greater detail, the portions of the JSOP in which the Navy has special interest.

Additionally, the OSD analysts are in daily contact with the service planners attempting to get from them the information required by the Secretary of Defense and in the form necessary to enable him to make his decision. The OSD analysts are invited to meetings and conferences held by the services concerning subjects of special interest to them to keep them current on problems and technological advancements being made in their areas. It is through these informal communications networks that the OSD analyst receives most of the data used in their systematic economic analyses.[2]

The framework of the Planning-Programming-Budgeting System is therefore the design within which Mr. McNamara makes his decisions and the continuous updating of the Five-Year Defense Plan is the blueprint for

---

[1] U.S. Department of the Navy, "The Navy Planning and Programming System," Office of the Chief of Naval Operations, Instruction 5000.19E, January 12, 1967, p. 5.

[2] Personal interview with an analyst, Office of the Assistant Secretary of Defense (Systems Analysis), March 8, 1967.

the future, or, more basically, the summation of all approved programs of all Department of Defense components.

Mr. Samuel M. Greenhouse of the Veterans Administration, for purposes of tying systems analysis to PPBS and yet differentiating between the two, says:

> PPBS may be captioned as a bag of premises, concepts and relationships; whereas systems analysis may be captioned as a bag of techniques attached to a way of approaching problems. [1]

He goes on to talk about what systems analysis is, in so far as PPBS is concerned:

> Systems analysis is the application of "benefit-cost" analytical techniques to several areas of the PPBS anatomy. [2]

Program budgeting and systems analysis are not the same, but they have an affinity for each other. The program budget expedites the decision-maker's review by describing the magnitude of major Defense Department programs and functions in terms of need, their relation to other programs, and the proportion of total defense expenditures. It also, through systems analysis, identifies the most efficient and economical of the possible arrangements of the work. In the words of Novick, "Program budgeting starts with the structuring of the problem and ends with analysis of the data." [3]

---

[1] Samuel M. Greenhouse, "The Planning-Programming-Budgeting System: Rationale Language, and Idea-Relationships," Public Administration Review, December, 1966, p. 276.

[2] Ibid.

[3] Novick, op. cit., p. xii.

CHAPTER IV

SYSTEMS ANALYSIS AN ECONOMIC APPROACH

Essential Features

Dr. Enthoven's operation in the Office of the Assistant Secretary of Defense (Systems Analysis), as it relates to the decision-making process of the Secretary, is viewed by him as applied economic analysis. He says:

> Economics is the science of the allocation of limited resources; the study of both how our economic system actually allocates resources and how it might be done more efficiently. . . . Whether we like it or not, we have a limited amount of goods and services available at any one time. [1]

It is within these limited resources that major decisions on force levels and weapons systems are made. Every systems analysis involves, sometime during its process, the comparison of alternative courses of action in terms of their costs and their related effectiveness in attaining a specified objective. This comparison, in an economic sense, takes the form of an attempt to designate the alternative that will minimize the costs, subject to some fixed performance requirement; or, conversely, it is an attempt to maximize some physical measure of performance subject to a budget constraint. This is the fixed-utility or fixed-budget approach to

---

[1] Alain Enthoven, "Systems Analysis and the Navy," Naval Review 1965 (United States Naval Institute, Annapolis, 1964), p. 102.

economic analysis described briefly in Chapter III.[1]

Such an evaluation is known as cost-effectiveness analysis, or, alternatively, cost-utility and cost-benefit analysis. It is in reality what economists describe as a marginal-cost and marginal-product analysis or a projection of how many increments of output will be received for the next additional increment of input. Cost-effectiveness studies are only part of the systems analysis approach. In analyses designed to furnish broad policy advice, other facets of the problem are of equal significance: the specification of sensible objectives; the identification or design of alternatives to achieve those objectives, and other assumptions underlying the analysis; the opening of new alternatives; and the possible establishment and justification of new objectives.[2]

There are some fundamental ideas of economics that are relevant to systems analysis. In the notion of economics there are always alternatives. There are alternative ways of using resources, alternative ways of doing a job, even alternative objectives to be achieved. Therefore, when an economist hears that a missile must have a range of 3,500 miles, he instinctively questions whether 3,000 miles or 4,000 miles might be better. Much of economic theory is concerned with the comparison of alternative ranges as regards accuracy increases or decreases of the missile, and as

---

[1] Fisher, op. cit., pp. 14-15.

[2] Enthoven, "Decision Theory and Systems Analysis," op. cit., p. 14.

regards the number of targets within the various ranges and the relative importance of these targets to the enemy.

Other economic considerations would involve the number of missiles to be employed. Of particular interest to the economist in this case is the marginal comparison. Dr. Enthoven uses, as his example, the comparison between costs and target destruction capabilities of a force of missiles with an expected percentage of target kill for each missile.[1] Marginal-cost and marginal-product analysis can be used to describe the situation for the decision maker wherein a certain number of additional missiles are required to destroy one additional target.

The description would illustrate the widespread incidents of diminishing marginal returns--that is, as the resources are increased in the given mission, after a point, the product or effectiveness would increase at a declining rate. To put it another way, the incremental cost of each increment of increased effectiveness rises. The decision maker can then judge at what point the extra effectiveness resulting from more forces is no longer worth the extra effort, rather than viewing the problem of military requirements determination as one of calculation of forces required to achieve an arbitrary selection of objective. This allows him to question objectives through comparison of alternative force sizes.

The economist would also view the objective in terms of an efficient mix of forces. This economic theory is an analysis of what is referred to

---

[1]Enthoven, "Systems Analysis and the Navy," op. cit., p. 103.

in the Department of Defense as balance of forces.[1] If the problem is to determine the efficient mix of X forces and Y forces, the first thing the economist would do is to determine the substitution possibilities. This analysis would determine various mixes of X and Y which would satisfy the objective. After this determination is made, a cost analysis of X forces and Y forces applied to the various mixes would illustrate the most economical combination of forces to accomplish the objective.

The same logical analysis can be made to the questions concerning increased quality at the sacrifice of quantity. To determine the optimum combination of "high quality - low quantity" or "lower quality - higher quantity" selections, it remains a problem of finding at which point the most economic quality and quantity mix is reached. This comparison can again be made between determination of accuracy and reliability in measures of effectiveness. These economic approaches to decision making will be discussed later in the study of systems analysis applications.

In this economic approach to systems analysis, there is no unique method to be followed, but, according to Mr. E. S. Quade, there are several stages through which analysis must advance: formulation; search; explanation; and interpretation.[2]

The formulation phase attempts to isolate the questions involved to define the meaning of the variables or factors that affect the situation, and

---

[1] Ibid., p. 104.

[2] E. S. Quade, Military Systems Analysis (Santa Monica: The RAND Corporation, January, 1963), pp. 7-8.

to state the relationships among these factors. This is the most important stage, because the process of restating the problem in different ways, redefining it, or expressing its limits will tend to identify whether the matter under consideration with its factors is significant and could point the way to its solution. Mr. Quade's advice here is not to accept the original statement from the "customer" of what is wanted exactly as proposed. "In fact, because the concern is with the future, the major job may be to decide what the policy maker should want to do."[1]

The search phase is concerned with finding the facts on which the analysis is based. During this phase, it may become necessary to look for different ideas, with evidence to support them, and in fact invent new alternatives, as well as look for facts. Unless there are alternatives and ideas about them, there is nothing to choose between and therefore no analysis.

An example of the invention of alternatives through analysis is cited by Mr. Hitch.[2] Early analyses of means to rapidly deploy forces to troubled spots around the world centered on the need to determine the most economical type of aircraft to procure for that purpose. Sealift, it was established, was much too slow to warrant consideration as an alternative. Included in the analysis as an alternative, however, was extensive pre-positioning of men and equipment, or of equipment only, in foreign countries.

---

[1] Ibid., p. 8.

[2] Hitch, "Decision Making in the Department of Defense," op. cit., pp. 71-72.

[illegible]

[illegible]

[illegible]

One of the major deficiencies in this alternative was the likelihood that the pre-positioned stocks would be in the wrong country, or even the wrong continent, when hostilities actually threatened to break out. The analyst's invention was to pre-position stocks on ships. When this alternative was added to the analysis, it substantially augmented the airlift rapid deployment capability.

In some cases during the search phase, however, the total number of alternatives may be endless. It then becomes a problem of limiting the alternatives to the most feasible in order to perform a meaningful economic study.

The explanation phase is essentially a listing of the alternatives and an examination of their implications and costs in order that they may be compared. After obtaining some idea of what the facts and alternatives are, it is necessary to construct them in such a way as to explain them and to determine their implications. In order to make much progress with real-world problems, we must ignore a great many of the actual features of a question under study and "abstract from the real situation certain aspects, hopefully, the relevant ones, which together make up an idealized version of the real situation."[1] This idealization, wherein elements can be controlled and manipulated to provide information as to results of certain decisions, is called a model.

---

[1]Quade, Military Systems Analysis, op. cit., p. 17.

All of the assumptions of the model must be made explicit. Since, generally speaking, there is often a variety of sets of assumptions available to the analyst and, as shown above, he must select from this variety, the analyst must "describe the significant alternative sets of assumptions and their implications in such a way that the responsible decision maker can make his judgment based on the full range of relevant assumptions."[1]

The interpretation phase is a critical examination of the results obtained from the model. The recommended solution must be viewed in the light of considerations which may not have been adequately treated by the model, since the model, as described, is an idealization of the real world chosen by the analyst.

Within the conceptual framework of fixed-utility and fixed-budget approaches to systems analysis, Mr. Fisher sets forth some important guidelines to be followed in order to make the economic diagnosis of the problem situation meaningful and of value to the decision maker.[2]

Proper structuring of the problem and design of the analysis is the most important guideline. Within the extremely complex environment of the Department of Defense, those items which are relevant must be included and separated from those which are irrelevant. In other words, the problem must be so structured that the right questions are being

---

[1] Enthoven, "Systems Analysis and the Navy," op. cit., p. 111.

[2] Novick, op. cit., pp. 41-47.

asked. It is probable that during some phase the design of the analysis will have to be restructured. Factors that seemed important originally may turn out to be relatively unimportant in the restructuring, and vice versa. In the process, as implied earlier, new questions, new objectives, or new alternatives may become obvious.

Building the analytical model is a simplified representation of the real world that includes and highlights the cause-and-effect relationships essential to the question studied. The means of representation may be a set of mathematical equations or a computer program or merely a verbal description of the situation. The role of the model is to estimate for each alternative the costs that would be incurred and the extent to which the objectives would be attained.

Uncertainty is recognized, and an attempt is made to take it into account. Fisher divides uncertainty into two main types: statistical uncertainty, which stems from purely chance elements of the real world; and uncertainties about the enemy's actions and reactions to given situations or technological advances that cannot be foreseen accurately.

There are three techniques used in the problem of dealing with uncertainty: sensitivity analysis, contingency analysis, and a fortiori analysis. In sensitivity analysis, several values are used (high, medium, and low), rather than one expected value, in order to determine how sensitive the alternative would be to these variations. In

contingency analysis, an investigation is made to see how the relative ranking of an alternative holds up by assuming changes in the general environment being considered. A fortiori analysis is used when the generally accepted intuitive judgment strongly favors alternative A, while the analyst feels that alternative B may be preferable. The analyst deliberately chooses to resolve the uncertainties in favor of A; and if his choice of B still looks good, he has a strong case favoring alternative B.

Treatment of problems associated with time further complicates the selection of a criterion for evaluating alternatives since one alternative may be best for this year, but another alternative may be better five years from now. This means that each of the alternatives has to be "discounted" through time by means of an appropriate rate of discount. More will be discussed on this point when specific analyses are presented.

Validity checking of the model determines whether the analytical procedure used is a reasonably good representation of reality. It is generally not possible to do this accurately when the problems that have time horizon considerations are involved, because the model is merely a representation of reality as it is known today with estimates of the future. Mr. Fisher implies that this is an often neglected guideline.

Qualitative supplementation is an integral part of the total analysis. It is necessary to interpret the quantitative results and to discuss and point out to the decision maker the non-quantitative considerations that could not be taken into account and their possible impact on the alternatives studied.

As can be seen from the above guidelines, there is an attempt to apply a "scientific method" to problems of economic choice. Systems analysis, particularly of the type required for military decisions, is still largely a form of art and not of science.[1] Using Mr. Fisher's guidelines, however, it is possible to establish a systematic approach to economic choice.

The need for systematic quantitative analysis in Defense is much more important than in the private sector of the economy. Seldom is there found one person who has an intuitive grasp of all the fields of knowledge that are relevant to the complex major defense problems. It would be possible in some areas to assemble a group of experts who, after discussion, could emerge with a fairly substantial answer. In general, however, and especially when the choice is not between two but among many alternatives, systematic analysis is essential for the decision maker.[2] Further, in contrast to the private sector where competition provides an incentive for efficiency

---

[1] E. S. Quade, Systems Analysis Techniques for Planning-Programming-Budgeting (Santa Monica: The RAND Corporation, March, 1966), p. 20.

[2] Hitch and McKean, op. cit., p. 108.

through the profit motive, efficiency in government depends on the conscious and deliberate selection of techniques and policies. Wherever the relevant factors are diverse and complex, as they usually are in defense problems, unaided intuition or past experience alone is incapable of weighing them and reaching sound judgments on the balancing of programs and systems.[1]

The need for systems analysis exists not only in the Office of the Secretary of Defense, but at the Joint Chiefs of Staff level and in the headquarters of the military departments. The purpose of the function is to help reduce the uncertainties in making choices among alternatives. This is not to say that uncertainties do not exist, but, rather than conceal them, a good analysis will bring them out.

The objective of the attempt of the economic approach to military decisions has been to build an integrated structure of systems analysis throughout the Department of Defense with the broadest kind of exchange of information techniques at and between the services and the various levels within the Department. This arrangement provides the checks and balances so essential to minimizing parochial viewpoints and organizational bias. The systems analyst must also be prepared to submit his work to critical scrutiny.

There is one of the scientific characteristics that can be applied to systems analysis and that is that it is an "open, explicit, verifiable,

---

[1]McNamara, op. cit., p. 3.

[illegible]

[illegible]

self-correcting process."[1] The objectivity of the method also makes it imperative that the military departments embrace its approach in their presentations to Mr. McNamara because he makes his attitude explicitly known with the following statement:

> I expect Defense executives to develop their portion of the national military strategy, operating plans, force structures, budgets, etc., based on reason rather than emotion.[2]

Recognized Benefits and Limitations

Benefits

Prior to World War II, military technology changed slowly. Military operations experience could relate new weapons, which were essentially product improvements, to forces and in turn to strategy. The technological explosion experienced since that time has, however, opened an enormous range of possible directions that the defense of this country could take. The buildable new weapons are fundamentally different from old weapons and the possible mix in application of these weapons is unlimited. The nation, although affluent, cannot afford to pursue all possible objectives. "Thus, military studies have become military-economic studies."[3]

---

[1]Alain C. Enthoven, "Choosing Strategies and Selecting Weapon Systems," An Address before the Naval War College, Newport, R.I., June, 1963.

[2]"Defense Decision Making as McNamara Sees It," Armed Forces Management, November 1963, p. 16.

[3]"How the Budget Decisions are Reached," Armed Forces Management, April, 1963, p. 13.

These military economic studies, embraced by systems analysts, allow a sorting and an identification of the complex questions of national defense. Without calculations, there is no way to get the answers to many of these increasingly complex defense systems and their interrelationship problems. Analysis offers an alternative to "muddling through" or to settling national problems by yielding to the strongest pressure group.

Systems analysis falls short of being scientific research because its predictions ordinarily cannot be verified and the urgency of military problems forces the substitution of intuition for verifiable knowledge. But, in contrast to other aids to decision making, it extracts everything possible from scientific methods by advancing through systematic stages of process. Its virtue, in fact, lies in the increased ability to take a "cold, hard look which individuals or organizations directly involved in the problem find difficult to take."[1] As applied in the Office of the Assistant Secretary of Defense (Systems Analysis), these analyses provide the Secretary of Defense with an objective overview of the total DOD posture. Being given an estimate of the costs, risks, payoffs, and the associated time span for each course of action, the Secretary of Defense is helped to understand the relevant alternative actions available to him and the key interactions of his decisions. The systems analyst may, by skillful questioning of the services, introduce new alternatives or bring about changes in objectives to make

---

[1]George H. Decker, "Costing Strategy," Armed Forces Management, September, 1963, p. 40.

There are many economic factors, such as economic stability, [illegible] to the [illegible] of the [illegible] demand. Without [illegible], there is no way to [illegible] problems. Analysis begins to [illegible] [illegible] filing decisions by looking at the [illegible].

Economic stability also [illegible] [illegible] problems [illegible] the [illegible] [illegible] to [illegible] from [illegible] by [illegible] [illegible] [illegible] be valid, a [illegible] [illegible] [illegible]

them more attainable.

The studies presented to Mr. McNamara should sharpen his intuition and certainly broaden his basis for judgment. It therefore follows that he should be in a position to make better decisions. Although value judgments, imprecise knowledge, intuitive estimates, and uncertainties about the action of others are all part of the systems analysis approach, the philosophy of systems analysis is reflected on a sign in Dr. Enthoven's office; it says, in effect, that it is better to be roughly right than absolutely wrong.[1]

Limitations

> Every systems analysis has defects. Some of these are limitations inherent in all analyses of choice. Others are a consequence of the difficulties and complexities of the question. Still others are blunders or errors in thinking, which hopefully will disappear as we learn to do better and more complete analyses.[2]

The oppsite of analysis is pure intuition. Intuition is in no sense analytic, since little or no effort is made to structure the problem or to establish interrelationships and their cause and effect in order to arrive at a solution. Pure intuition has its defects, but seldom are they recognized or admitted by the decision maker using that method.

This is not to say that judgment and intuition are not components of systems analysis; they actually play an important role. They are used in

---

[1] Holcomb, op. cit.

[2] Quade, Systems Analysis Techniques for Planning-Programming-Budgeting, op. cit., p. 19.

designing the models; in deciding on alternatives to be considered; in deciding on the relevant factors; and in interpreting the results. The pitfalls of analysis are in these areas. For example, the analyst may limit the problem to what he "feels" the boss may want to see; he may fail to recognize such factors as military posture, political purpose, or technical feasibility; or he may take too seriously the apparently precise results that seem to come with such high-precision analysis, forgetting that the analysis was based on little more than judgment and intuition. The decision maker should be alert to these pitfalls as he weights the merits of any analytical study. Therefore, all ecological factors bearing on the analysis must be brought to his attention when the recommendations are presented.

Besides these pitfalls, there are some inherent limitations of systems analysis itself as applied to PPBS. The first of these is that the analysis is necessarily incomplete. The inquiry is limited by time and money costs.[1] Time considerations are particularly important in the Department of Defense and in military analysis, because the decision maker can generally not wait long for an answer. The cost of gaining complete information is often prohibitive. For example, it would be interesting to know what the effect on the Southeast Asian situation would be if the city of Hanoi were bombed. To find out, one could drop the bomb, but clearly this is too costly a means of getting complete information. Even without time or money cost

---

[1]Quade, Military Systems Analysis, op. cit., pp. 15-16.

limitations, however, analysis can never treat all of the considerations that may be relevant. Many are too intangible--for example, national emotion, political expedience, and morality matters.

The second inherent limitation of the systems analysis approach is that measures of effectiveness are satisfactory approximations at best. No one, for example, can say what the effectiveness of some deterrent action would be since, even with the best intelligence reports, the mind of the enemy cannot be read. The pending decision concerning the anti-ballistic missile missile is an example.

Thirdly, there is no satisfactory way to predict the future. The range of possible cold-war hot spots is almost limitless. A force could be built to thwart an all-out aggression--if that were the extent of our concern. We could design a force structure for a particular war in a particular place that would make optimal use of our resources--if we actually became involved in that particular war in that particular place. Systems analysis cannot predict these conditions, nor can any other system.

Despite these limitations and pitfalls, careful consideration of whatever relevant matters can be discovered is beneficial to the formulation of decisions. The important thing is that reliance on the systems analysis approach be tempered with a realization of these limitations.

CHAPTER V

APPLIED SYSTEMS ANALYSIS

General Application

The proponents of systems analysis argue that the economics of choice is neither new nor should it seem strange or mysterious to anyone. They argue that many systems analysis approaches are used in everyday life. One example given is that systems analysis is no different from the activity of a housewife shopping for bargains while making the rounds of several grocery stores or by merely searching through the newspaper for the best buy on some items required. A slightly more complicated, yet homely version of the systems analysis approach was described by LCdr. Holcomb of the OASD(SA) staff.[1]

When the old family car breaks down, the problem is what to do about its replacement. Several alternatives can, of course, be considered and the relevant data applied to these alternatives. For example, it could be repaired; it could be replaced with the same kind of car; it could be replaced with a more austere model; it could be replaced with a foreign model; it could be replaced by a more expensive model with air conditioning; or it could be entirely disregarded--neither replaced nor repaired--and the family scheduled to use the bus. These are the various alternatives, and

---

[1] Holcomb, op. cit.

considerations of need, cost, utility, continued expense, available funds, terms of finance, and even the size of the garage all enter into the decision. The implication is that without cost-effectiveness analysis everyone would be driving Cadillacs.

Mr. Hitch declares that cost-effectiveness studies or systems analyses are needed in the Department of Defense to determine "how much is enough."[1] The military requirements, as stated presently, tend to be in absolute terms. Traditionally, military requirements studies were typified by calculations of forces required to achieve a single hypothesized objective.

A simplified example is provided by Mr. Hitch to show the difference between the traditional method of calculation and the new economic approach.[2] This example supposes that the objective was to achieve an expectation of destroying 97 per cent of 100 targets, using missiles having a 50 per cent single-shot kill capability. The traditional requirements study would conclude that 500 missiles were needed because: 100 missiles would achieve an expectance of 50 kills; 200 missiles, 75 kills; 300 missiles, 87 kills; 400 missiles, 94 kills; and 500 missiles, 97 kills. This, of course, merely reflects the operation of the familiar law of diminishing returns. The significant point is that the last 100 missiles would increase the kill expectation by only three extra targets, from 94 to 97. Using economic analysis,

---

[1] Hitch, "Decision Making in the Department of Defense," op. cit., p. 66.

[2] Ibid., p. 66.

several questions should be asked: "Do we need a capability to destroy 97 per cent of the 100 targets?" Or, "Is the capability to raise target destruction from 94 to 97 per cent worth the cost of 100 extra missiles?" In other words, not only total costs and total products should be examined, but also marginal costs and marginal products.

Interface of OSD Systems Analysis and the Navy

One of the most widely publicized and perhaps most critically appraised decisions of economic choice that affected the Navy was the decision not to construct nuclear-powered ships as recommended by the Navy and to proceed with conventional ship construction, specifically in the case of the aircraft carriers USS America and the USS John F. Kennedy.

The discussions center on the economic approach itself and its usefulness in military decision making. Some critics contend that economics has nothing to do with weapons systems and military requirements. Others state that military requirements and economics can be related in peacetime, but that during wartime, when military budgets are virtually unlimited, economics is irrelevant. Dr. Enthoven explains that these lines of criticism are wrong and repeats that "we have only a limited amount of goods and services available at any one time."[1] For one thing, there are only so many man hours available for productive activity and even during war there

---

[1]Enthoven, "Systems Analysis and the Navy," op. cit., p. 102.

Imperfect Competition Analysis and Its Flaws

One of the most widely publicized and perhaps most criticized theoretical doctrines of economic choice that stresses the theory and the practice of imperfect competition, especially in the structure of the national economy, is the 1938 John K. Galbraith.

The theoretical center of the economic approach that the university is solidly decision making. Some critics contend that economics has nothing to do with making value and ordinary requirements. Others note that ordinary requirements and economics can be related to decision, during meetings, when ordinary business are usually conducted. Or, Galbraith is saying that there are only a limited number of people and services available at any one time.[1] For our time, there are only so many hours available for interested economic and also during any time

---

[1] Galbraith, "Imperfect Industry and the Mass," op. cit., p. 60.

are other things needed besides defense; food, clothing, housing, education, and medical services are still required. His point, therefore, is that "in peace or in war, only a limited amount of resources is available for defense. . . . It is important that we use those resources well."[1]

This basic economic fact is the basis of the position of the Secretary of Defense concerning the nuclear/conventional carrier controversy. The construction cost of a conventional carrier is about $280 million. It would have cost over $400 million to make the carrier nuclear-powered. The economic argument follows that, given $400 million, it is possible to build one conventionally powered carrier plus four destroyer escorts or one nuclear-powered carrier with no escorts. The decision in this case is between the alternative ways of spending the $400 million. Dr. Enthoven argues that there may be disagreement on which is the better way to spend the money "but there should be no disagreement that it is necessary and correct to pose the problem in this fashion."[2]

The element for decision in this case is whether nuclear power on the carrier is worth the sacrifice of four destroyer escorts. Therefore, someone arguing for the nuclear-powered aircraft carrier should be willing to argue that its effectiveness would be greater than the combined effectiveness of the conventionally powered carrier and four escorts.

Dr. Enthoven implies that this kind of argument was not received from the Navy or from Congress, who also supported the nuclear carrier.

---

[1] Ibid.

[2] Ibid.

[illegible]

[illegible]

The argument as presented was that "we should buy the 'best' carrier available, cost not considered, and then, if they are needed, buy the four destroyer escorts also."[1] Another facet of the Navy argument was that arbitrary budget limitations should not restrict the progress of technology in warship construction when the transition from oil fuel to nuclear fuel is as common as the transition from sail to coal and from coal to oil in the history of naval warships. Admiral Rickover, certainly the greatest advocate of nuclear-powered ships, used extracts from the Secretary of the Navy's 1963 testimony before the Joint Committee on Atomic Energy to press his point.

> The basic question now before us is simple: Will we meet the future challenges at sea with modern, high-speed, nuclear-powered surface forces, or will we continue the shortsighted budgetary expedient of hamstringing our new ships--already too few in number--with obsolete engines?
>
> The dollar amounts for the new propulsion plants are large, but only in terms of initial investment. They are not the huge, unmanageable sums they appear to be when they are compared with the going price of weapons system investments which are built around these plants.[2]

Expanding on the previous discussion of the economic question of how to use the $400 million, the point can again be raised that if the budget limitation were not present, the man who wants a nuclear carrier plus four destroyer escorts without budget limitation would have to reckon with the fact that an increase in funds would then make it possible to have a

---

[1] Ibid.

[2] U.S. Congress, Subcommittee of the Committee on Appropriations, Hearings, Department of Defense Appropriations for 1967, 89th Cong., 2d Sess., 1966. Testimony presented by VAdm. Hyman G. Rickover, p. 71.

conventional carrier and eight destroyer escorts. The question of which way to spend the money is still present. This is the kind of questions asked by the Secretary of Defense, and the Navy is reluctant to answer him satisfactorily.

On the subject of nuclear carriers, the Navy engaged in extensive study to show that the cost of nuclear power over twenty-five years was not much more than the cost of conventional carriers over the same period of time.[1] The one ingredient lacking for the satisfaction of the Secretary of Defense was some quantifiable estimate of the increase in effectiveness of the nuclear-powered ship. The Navy statement, concluding their cost breakdown, was that "nuclear power for surface ships offers a major increase in effectiveness."[2]

As shown before, the Navy and the Secretary of Defense are faced with the decision of how to allocate their resources. If nuclear power costs 33 per cent more for the same ship type, should the resources be divided between three nuclear ships or four conventional ships? The only economic way to make this allocation is to determine some quantity of increased effectiveness of nuclear ships over conventional ships that would make it worth having only three carriers versus four.

---

[1] Ibid., pp. 88-89.

[2] Enthoven, "Choosing Strategies and Selecting Weapon Systems," op. cit., p. 16.

---

[1] Ibid., pp. 13-14.

[2] Burdeau, Cleveland Orestes, and Stanley Vinson Entrekin, op. cit., p. 12.

The lack of effective quantification of effectiveness was only one of the problems of analysis facing nuclear carriers. One other problem was that the time horizon and method of "discounting" in order to establish present worth was not compatible within the Office of the Secretary of Defense and the Navy. Certainly, length of the life cycle of a carrier, which extends well into the 21st century,[1] would complicate the analysis, and fractions of difference in input could distort the presentation of facts to suit the presentor if preconceived notions of the outcome were held. This is an example of the danger in the treatment of alternatives with time horizons, as discussed earlier.

The then Secretary of the Navy, Fred Korth, never did satisfy Mr. McNamara on the justification of nuclear-powered carriers, and the Secretary of Defense ordered construction begun on conventionally powered carriers. It was not until 1965, when the Navy's case became stronger with some technological breakthroughs, that McNamara again considered nuclear power.[2]

Several more current examples of the presentation and acceptance of economic "marginal utility - marginal cost" studies were gathered through a series of personal interviews with Navy personnel in the Office of the Chief of Naval Operations and with military and civilian personnel in

---

[1]Testimony of Rickover before Subcommittee of the Committee on Appropriations, op. cit., p. 90.

[2]Seligman, op. cit., p. 246.

the Office of the Secretary of Defense.[1] Further insight was provided through recent organizational documents. One of the first facts discovered was that the Navy is realizing that their presentations to the Secretary of Defense through formal and informal channels are not receiving the acceptance hoped for, nor are they being utilized in their total form by the Office of the Secretary of Defense systems analysis people in the preparation of Draft Presidential Memoranda.

Recognizing a need for a capacity for their own systems analysis capability and a central repository for the talent required, the Navy established, within the last eight months, a Systems Analysis Division in the Office of the Chief of Naval Operations. In addition, an internal memorandum was issued to the force sponsors in the Navy, who have the responsibility for deriving requirements for naval forces and for supporting such requirements, in order to assist them in writing good solid force rationale that will survive the critical analysis in the Secretary of Defense arena.[2]

The purpose of that memorandum was to promote force level analyses that relate missions, capabilities, threats, and strategic considerations

---

[1]Because of the sensitive nature of some of the statements made by those interviewed, anonymity was guaranteed and therefore their identity and position in the organization will not be disclosed. Only the office will be identified.

[2]U.S. Department of the Navy, "A Guide for Force Sponsors," Office of the Chief of Naval Operations Memorandum 997-66, July 21, 1966.

analytically to quantitative requirements. It has also been recognized that the considerations in these analyses should be made available to the OSD analysts through the Joint Strategic Objectives Plan or at least as an addendum to it. Previously only the conclusions of such examinations were made known, without a definition of the underlying assumptions and alternatives. The memorandum recognizes the realities of the Secretary of Defense role in decisions regarding the Navy's force levels.

> The facts of life of the present OSD force review cycle demand inclusion of adequate analysis in the JSOP (including an examination of alternatives, assumptions, and cost considerations), if the JSOP is to be influential in the SECDEF determination of the necessary force levels. [1]

A hypothetical example of something the OSD systems analysts received as guidance from the Navy last year is a statement of requirements for additional destroyers. [2] The Navy's statement merely made known the fact that Marine lives could be saved by additional off-shore fire power. To provide this fire power, X number of destroyers were needed. The considerations made by the Navy prior to this statement of requirements were not made available to the Office of the Secretary of Defense. Without these considerations, the information was of little value to the analyst or to the Secretary as decision maker.

The next attempt was much more detailed; in fact, it revealed a great amount of study effort. This statement included quantification of the numbers

---

[1] Ibid., Tab B, p. 2.

[2] Personal interview with a group of military and civilian personnel in the Office of the Secretary of Defense, March 8 and 9, 1967.

---

[1] Ibid., Tab B, p. 4.

of destroyers required and the benefits to be gained in terms of Marine lived saved, as in the following simplified hypothetical display:

Number of Destroyers	Number of Marine Lives Saved
X - 3	A - 175
X - 2	A - 94
X - 1	A - 36
X	A
X + 1	A + 3
X + 2	A + 4
X + 3	A + 4

On the basis of this type of analysis, the decision maker could make a judgment concerning the risk taken by reducing the number of destroyers and the point where additional guns would provide no additional benefit. This study is by itself still of little value to the OSD analyst in making recommendations concerning the number of destroyers needed because it does not show other considerations made by the Navy concerning other means of providing fire power, such as air strike. The question still unanswered in the mind of the Secretary of Defense is whether or not it would be advantageous to increase the force by one carrier and some lesser number of destroyers so as to add flexibility to the off-shore fire power and save even more Marine lives. Other considerations not revealed in this type of analysis are the increases in other types of naval warfare capability, such as increased anti-submarine warfare capability as a result of increased carrier or destroyer forces.

During an interview in the Office of the Chief of Naval Operations, there was discussion concerning the presentation of something of new design to replace something now in use. Their feeling was that no alternatives could be created concerning this new weapon system.[1] Follow-up discussions in OSD indicated that many alternatives will certainly be considered prior to a decision by the Secretary; for example:

- Buy none of the new things and continue use of the old;
- Buy some of the new things and use them with some of the old; or
- Use something different from either the new or the old.[2]

Certainly some considerations were made by the Navy prior to its decision to plump for the new thing. Unless these considerations are made visible to the Office of the Secretary of Defense, however, the OASD(SA) will create alternatives and analyze their various economic costs and utilities.

The Office of the Secretary of Defense recently issued a directive concerning the requirement for economic analysis of proposed defense investments with a hypothetical example that parallels the one shown above. In this case the project is a proposal to replace a number of forklift trucks with a lesser number of superior type trucks. The benefits to this proposal are savings in maintenance and reduction in the number of forklift drivers required, and these benefits can be quantified. However, since forklift

---

[1] Personal interview with a naval officer in the Office of the Chief of Naval Operations, March 8, 1967.

[2] Personal interviews in OSD, op. cit.

[illegible]

[illegible]

[illegible]

trucks are currently in operation and are doing a satisfactory job, it "must be demonstrated in the analysis that a real saving (or increase in benefits) may conservatively be expected over a number of years."[1]

Economic study is not only applied to cost but to alternatives as applied to threat and capability as well. Systems analysis takes these elements into account as well as cost comparisons. One simple problem in this category of systems analysis is that of choosing the next generation of surface-to-air missiles.[2]

The possible alternative missile systems may differ widely with respect to accuracy, range, payload, and certain other characteristics, such as alert status. It may seem obvious, for example, that if the accuracy of the new missile can be improved over the old, the result will be more enemy planes damaged. The systems analysts, however, state that it is not necessarily true that the missile with the highest accuracy will necessarily maximize the effectiveness of the over-all system. It may not even give the individual missile within the system its highest kill potential.

If, for example, additional guidance and control equipment were added to the missile to improve its accuracy, the incremental increase in weight might reduce increments of range or speed of the missile. Also, the greater complexity of more accurate guidance equipment might adversely

---

[1]U.S. Department of the Navy, Navy Comptroller Review, P-1360, XIV, No. 1 (March, 1967), 8.

[2]Personal interviews in OSD, op. cit.

[illegible] [illegible] [illegible] [

affect its reliability. Consequently, in spite of the increased accuracy, the over-all effectiveness might be reduced.

Most Navy problems, in fact, involve more complex analyses than just cost; for example, operational and logistical factors such as mobility, communications, supplies, maintenance, personnel, and training. Actions or interactions of all of these elements must be considered in the systems analysis approach.[1]

The systems analysts in the Office of the Secretary of Defense are currently enjoying extreme confidence in their approach to problems and this is revealed in their dealings with senior military people. One officer explains the situation in this way: "Just because you have a chest full of ribbons and fought every war since 1900, it's no longer axiomatic that you have all the military answers on new weapons."[2]

An example of this was revealed during an interview with a civilian member of the Office of the Secretary of Defense.[3] He has had numerous discussions with a Vice Admiral, in the Office of the Chief of Naval Operations, concerning the requirements for a major weapon system. The Admiral, who has been concerned with this type of weapon system for his entire career, is being pressed to explain why he needs X + 20 units of this weapon system while the member of OSD maintains that he needs only X units to wage war effectively. In order to justify the additional units, the Admiral is requested

---

[1] Ibid. [2] Ibid. [3] Ibid.

---

[1] Ibid.

[2] Ibid.

[3] Ibid.

to present an incremental analysis of every unit beyond X that he states as a requirement. In his opinion, this is unnecessary since the twenty additional units above X is the number that he calculates as an attrition rate. His stand is that in order to have X units to wage war, X + 20 units will be required since some will be lost immediately or for various other reasons will not be available for the war.

The OSD point of view is that attrition rate has no bearing on the problem. Either the Navy will begin the war with X units or X + 20 units and not with X units with 20 in the storage shed waiting to replace the ones that are destroyed. With this position, how much could X do and how much could X + 1, X + 2, or X + 20 produce in terms of national defense? This situation between the Office of the Secretary of Defense and the Office of Naval Operations is presently stalemated.

During a 1966 Congressional review of the Department of Defense Cost Reduction Program, the conflict between the Navy and the Secretary of Defense decision on procurement of F-4 aircraft for Navy and Marine Corps use became an issue of concern to the subcommittee.[1] Of significant concern was the validity of the planning that goes into the Five-Year Defense Plan which projects the military requirements over a five-year period. The December, 1961, plan approved 150 F-4's for Fiscal Year 1965. In November, 1962, the Secretary of Defense reduced this number to 132 by

---

[1] U.S. Congress, Examination of the Department of Defense Cost Reduction Program, Report of the Subcommittee for Special Investigations of the Committee on Armed Services, 89th Cong., 2d Sess., September 12, 1966, pp. 34-37.

[illegible] [illegible] [illegible] [

eliminating tactical and training squadrons and mixing F-4's and F-8's on the carriers. The Secretary of the Navy made a strong appeal but the final decision document did not reflect any of the Navy recommendations and held forth on the original decision of 132 F-4's.

Although specifically requested to do so, the Office of the Secretary of Defense produced no evidence that between the approval of the force structure in December, 1961, and the reduction of the procurement of F-4's by the Secretary of Defense, less than a year later, any new factors or considerations had developed which were not known at the time of the original decision. This suggested to the subcommittee that either the basic planning was faulty or the subsequent cut arbitrary.

Although this example took place during the very early stages of the development of the Five-Year Defense Plan and the systems analysis approach, some Navy people have similar criticism today. When reclama are submitted on Initial Draft Presidential Memoranda, they feel that the final decisions should reflect that the data submitted in these reclama have been considered; however, often no analysis at all of the reclama is visible to the Navy force sponsor. This, in effect, makes the decisions of the Secretary of Defense seem arbitrary since the Navy has no knowledge of the facts considered or the assumptions made in arriving at the final decision.[1]

---

[1]Personal interview with a naval officer in the Office of the Chief of Naval Operations, op. cit.

[illegible] Secretary of the Navy made a strong appeal but the final [illegible] document did not reflect any of the Navy recommendations and held [illegible] to the original decision of 12 F-13's.

Although specifically provided for, the [illegible] Navy of Defense [illegible] provided no guidance that between the approval of the force structure in December, 1961, and the production of F-111's by the Secretary of Defense late that a year later, any two Defense [illegible] decisions had developed which were not known at the time of the initial decision. This suggested to the [illegible] that either the Defense planning was wrong or the economy can withstand.

Although this [illegible] took place during the very early phase of the development of the Five-Year Defense Plan and the systems analysis approach, some Navy people have absolute confidence today. Other critics are reminded of Initial Cruise Predictions. They [illegible] the [illegible] conviction should reflect the [illegible] in their predictions have been considered. However, when an analysis of all of the realities is visible in the Navy [illegible] program. This, in essence, [illegible] the decision of Secretary of Defense when objectives rather the Navy [illegible] of the parts developed or the weaponsystems result in excluding of the final decision.[1]

---

[1] Personal Interview with a naval officer in the Office of the Chief of Naval Operations, op. cit.

Economic studies and analyses are not the only factors that the Secretary of Defense considers in his decision, but they certainly play a major role in the force levels approved for all of the services. The primary service input should be the Joint Strategic Objective Plan supplemented by service Secretary input. The JSOP, in its present form, is not being used by the OSD analysts in their preparation of Draft Presidential Memoranda because the analyses as shown above are incomplete.[1] Many special studies must be made and special information provided by the services in addition to the detailed preparation for the service programs included in the JSOP force requirements.

There is an immeasurable amount of work involved in this effort, not only by OSD but by the services as well. Admiral Rickover gave some hint of this fact in his testimony before a Congressional Subcommittee:

> I have no people in my organization whose specific duty it is to prepare studies and position papers. So we are placed in the position of having to counter the Department's huge staff with our own efforts. Our "day labor," to quote Milton again, is so onerous that we must work far into the night to prepare these studies--or else, give up.[2]

A thorough examination of alternative ways of achieving an objective is, however, the heart of both systems analysis and the military decision-making process of today. In order to use systems analysis most effectively

---

[1] Personal interviews in OSD, op. cit.

[2] Rickover testimony, op. cit.

as a tool for decision making, its benefits and limitations must be recognized not only by the people providing the studies and information, but by the analysts and decision makers utilizing the information as well.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Prior to Mr. McNamara's appointment as Secretary of Defense, the Congress had passed through several major progressions of strengthening the authority of the office. No previous Secretary had been able to truly manage the complexities of the Department of Defense. The Office of the Secretary had, in fact, little involvement in the decision processes of the Department until budget submissions were made. He was able to do little more than accept the funds granted by the Congress and divide the total into three parts and allocate these funds to each of the services, thus allowing them to establish priorities of programs independent of each other and also develop their own forces independently.

The President, when appointing Mr. McNamara, charged him "to determine what forces were required and to procure and support them as economically as possible."[1] The new Secretary aggressively pursued his role as that of a manager rather than a mere administrator or judge of the decisions being made in the Department of Defense. In his opinion, the defense program, to be really meaningful, must be looked at in its entirety

---

[1]McNamara, op. cit., p. 2.

[1] Wolfinbarger, op. cit., p. 2.

with each of its elements considered in light of the total program, and this, he believed, could be done only at the Office of the Secretary of Defense level.

Mr. McNamara has been effective in carrying out his role as he sees it. He personally makes the final decisions on most major military projects and force levels considered in the Department. He has been able to accomplish this through the Planning, Programming, and Budgeting System which he and his comptroller, Charles Hitch, put into operation. This system first oriented all military forces around related missions regardless of the military service. The Five-Year Defense Plan presents these force structures and cost projections in terms of the principal missions of the Department of Defense. The process of continuously updating the FYDP is essentially the PPB System. By requiring Secretary of Defense approval to all changes to the Plan, Mr. McNamara has effectively established the capacity for centralized decision making in his office. The Planning, Programming, and Budgeting System has therefore become the design for decision making in the Department of Defense and the Five-Year Defense Plan is the ever-current blueprint for the future.

In conjunction with the institution of the PPBS, a method of review of program and force level proposals was incorporated. This method is called systems analysis. Basically, systems analysis is an approach to or a way of looking at complex problems of choice under uncertainty. Its purpose is to suggest a course of action, to the decision maker, by

systematically examining the objectives, costs, effectiveness, and risks of alternatives and designing additional ones if those examined are inadequate.

Dr. Enthoven, the Assistant Secretary of Defense (Systems Analysis), describes his operation as applied economic analysis. In this light, it is a study of how the Department of Defense allocates its resources, and how it might be done more efficiently. He, in effect, analyzes the marginal cost of DOD resources in relation to the marginal benefit expected to be gained from the expenditure. In addition, he views the program elements of the PPB System to determine if the most efficient mix of forces is being considered. Although systems analysis is an art, not a science, its approach to problems is systematic. The intent of systems analysis is to apply an objective view to Defense plans and programs and to provide the Secretary of Defense with a base from which to make intelligent decisions.

There are certain limitations to the approach of systems analysis. For example, the analyses are necessarily incomplete in most cases because the time allowed to make the analyses is limited, as is the cost; many considerations cannot be treated because they are intangible in nature, like emotional, political, and morality matters; many measures of effectiveness are considered approximations at best; and there is no way to predict the future. Further, judgment and intuition are important ingredients in the designing of models; in deciding on the alternatives to be considered; in deciding on what is relevant and what is not; and in the interpretation of the results. Each of these ingredients necessarily affects the outcome of the analysis.

The military services have been encouraged to retreat from parochialism and to submit their proposals to the Secretary of Defense in the format used by the systems analyst. Up to this time, the services have not been able to accomplish this to the complete satisfaction of Mr. McNamara or Dr. Enthoven. The Joint Strategic Objectives Plan (JSOP) has made some progress in this direction, but the improvements have been relatively minor. The JSOP is still not being used by the OSD analysts in their preparation of Draft Presidential Memoranda.

The Navy, in particular, has been frustrated in its attempts to convince the Office of the Secretary of Defense of its requirements. This is due primarily to the fact that their presentations have been less than complete. There are three reasons for this incompleteness: (1) a reluctance on the part of program and force sponsors to provide alternatives to their determined requirements, fearing that their positions would be diluted; (2) insufficient knowledge of other programs being sponsored within the Navy and the other services; but most importantly, (3) a lack of realization of the nature of the analysis to which their recommendation would be subjected at the OSD level. What was not understood (and still is not in some elements of the Office of the Chief of Naval Operations) is that the OSD analysts create their own alternatives to single-position presentations. This is dilution of the worst kind because, for the most part, the analysts are not in as good a position as the program or force sponsor to present alternatives and make assumptions concerning their projects.

Realizing this fact, the Office of the Chief of Naval Operations is in the process of revising its force level requirements presentations to include alternative ways to achieve the objectives. They are attempting to contrast the capabilities of present programs with the additional capabilities provided by the recommended force objectives, and to quantify the difference in capability in terms more meaningful than "more" or "less." Alternative mixes of forces are sometimes considered in the Navy, but because of its organizational structure this is not always true, as shown in the off-shore support mission study where destroyer forces were considered without examination of air attack capability.

The Navy has felt other frustrations from decisions made by the Secretary of Defense because the OSD analysts' studies are not always provided to the Navy to show either the alternatives considered or the assumptions made during the study.

One of the major purposes of the systems analysis approach is to provide the Secretary of Defense with a base for decisions which is free of parochial or emotional influence. And although the proponents of systems analysis recognize and admit to the limitations inherent in the approach, observations made during interviews indicated that some of the analysts are less aware of these limitations in the actual practice of their art. The danger here is that by extolling, without qualification, the virtues of "quantified common sense," the systems analyst could develop a parochialism of his own.

The systems analysis approach, although not fully recognized or utilized within the services, is serving an important function in the Department of Defense. The long-range plans, the intermediate programs, and the immediate budget requirements are receiving critical analysis which is necessary to provide decision-making capability to the Secretary of Defense. Recognition of the increased importance of the systems analysis approach is manifest in its recent elevation to an Assistant Secretary of Defense level. The office has also been expanded from 45 people in 1963 to its present staff of over 140.

The entire planning-programming-budgeting system with its accompanying analysis effort is here to stay. The President has directed all Federal agencies to implement the system. PPBS and systems analysis techniques are not really new. One of the greatest problems is to eliminate the mystery surrounding the concept. As Mr. Mogin pointed out in his speech before the Navy Financial Management class:

> There is nothing novel about the system we have established, except perhaps as regards the manner in which we have assembled the various components of our planning, programming, budgeting system and our analysis process. As Dr. Enthoven likes to state, "What is really new, is that we are doing it."[1]

---

[1]Mogin, op. cit.

BIBLIOGRAPHY

Public Documents

Executive Office of the President, Bureau of the Budget, Bulletin No. 66-3, to the Heads of Executive Departments and Establishments, October 12, 1965.

U.S. Congress. Department of Defense Reorganization Act of 1958. P.L. 85-599. 85th Cong., 2d Sess., August 6, 1958 (72 Stat. 514).

_____. National Security Act of 1947. P.L. 253, 80th Cong., 1st Sess., July 26, 1947 (61 Stat. 495).

_____. National Security Act Amendments of 1949. P.L. 216. 81st Cong., 1st Sess., August 10, 1949 (63 Stat. 578).

_____. Reorganization Plan Number 6 of 1953 (67 Stat. 638).

_____. Subcommittee of the Committee on Appropriations. Hearings, Department of Defense Appropriations for 1967. 89th Cong., 2d Sess., 1966. Testimony presented by Vice Admiral Hyman G. Rickover.

U.S. Congressional Record. 89th Cong., 2d Sess., October 12, 1966.

U.S. Department of Defense. Charter for the Assistant Secretary of Defense (Systems Analysis). Department of Defense Directive 5141.1, September 17, 1965.

_____. DOD Programming System (DOD Directive 7045.1), October 30, 1964.

_____. Organization Chart of the Office of the Assistant Secretary of Defense (Systems Analysis), April, 1966.

U.S. Department of the Navy. "A Guide for Force Sponsors." Memorandum from the Office of the Chief of Naval Operations, No. 997-66, July 21, 1966.

_____. Charter for Systems Analysis Group, Office of the Chief of Naval Operations.

Public Documents

Executive Office of the President. Bureau of the Budget. Building Blocks in the Fiscal Program. Washington: Government Printing Office, October 15, 1951.

U. S. Congress. Department of Defense Reorganization Act of 1958. H. R. 12-249. 85th Cong., 2d Sess., August 6, 1958. 117 pp.

_____. National Security Act of 1947. P. L. 253, 80th Cong., 1st Sess., July 26, 1947 [61 Stat. 495].

_____. National Security Act Amendments of 1949. P. L. 216, 81st Cong., 1st Sess., August 10, 1949 [63 Stat. 578].

_____. Reorganization Plan No. 6 of 1953 [67 Stat. 638].

_____. Subcommittee on the Economics of Procurement. Economic Effects of Changes in Procurement Policies. 83rd Cong., 2d Sess., 1954. Testimony presented by Vice Admiral Donald B. Billingsley.

U.S. Comptroller General's Report. 87th Cong., 1st Sess., October 12, 1961.

U.S. Department of Defense. Charter for the Logistics Executive Board. Defense Logistics Publication. Department of Defense Directive 5111.1, September 17, 1958.

_____. DOD Programming System [DOD Directive 7045.7], October 24, 1961.

_____. Organization Chart of the Office of the Assistant Secretary of Defense (Properties and Logistics), 1961, 1962.

U.S. Department of the Navy. Guide for Force Planners. Washington: Office of the Chief of Naval Operations, May 1958, 117-12, July 31, 1958.

_____. Change for Systems Logistic Group. Office of the Chief of Naval Operations.

U.S. Department of the Navy. "The Navy Planning and Programming System." Office of the Chief of Naval Operations Instruction 5000.19E, January 12, 1967.

_____. The Navy Programming Manual. Office of the Chief of Naval Operations (OPNAV 90P-1), June 11, 1965, with changes.

Books

Hitch, Charles J., and McKean, Roland N. The Economics of Defense in the Nuclear Age. Cambridge: Harvard University Press, 1960.

Novick, David. Program Budgeting: Program Analysis and the Federal Budget. A RAND Corporation publication. Washington: U. S. Government Printing Office, 1965.

Taylor, Maxwell D. The Uncertain Trumpet. New York: Harper and Bros., 1959.

Articles and Periodicals

Decker, George H. "Costing Strategy," Armed Forces Management, September, 1963, pp. 36-40.

"Defense Decision Making as McNamara Sees It," Armed Forces Management, November, 1963, pp. 15-17.

Enthoven, Alain. "Decision Theory and Systems Analysis," The Armed Forces Comptroller, IX, No. 1 (March, 1964), 12-17 and 38-39.

_____. "Systems Analysis and the Navy," Naval Review 1965 (United States Naval Institute publication), 1964, pp. 99-118.

Fisher, Gene H. The World of Program Budgeting. A presentation to a Conference on Program Budgeting and Cost Analysis, University of California at Los Angeles, June 2, 1966 (A RAND Corporation issuance), pp. 1-28.

Greenhouse, Samuel M. "The Planning-Programming-Budgeting System: Rationale Language and Idea-Relationships, Public Administration Review, December, 1966, pp. 271-277.

Hitch, Charles J. "Decision Making in the Department of Defense," DMSC Handout XIII-1, from the H. Rowan Gaither Lectures in Systems Sciences, at the University of California (Berkeley), April 5-9, 1965, pp. 1-103.

U.S. Department of the Navy. "The Fly-in Training and Proficiency Program." Office of the Chief of Naval Operations Instruction 3500.1E, January 15, 1977.

_____. The Navy Programming Manual. Office of the Chief of Naval Operations (OPNAV 3910-1), June 11, 1980. 4th revision.

Books

Hibbs, Clayton A., and Richmond, Eleanor M. The Evaporation of Chemicals. The Boulder Age: Chemistry. Harvard University Press, 1980.

Inman, David. Photonic Processing. Electronic Industry and the Digital Budget. A Rand Corporation publication. Princeton: D. Van Nostrand Company Publishing Co., 1979.

Taylor, Maxwell I. The Observation Process. New York: Harper and Brothers, 1974.

Articles and Periodicals

Fenner, George H. Crossing Boundary. "Ground Crews Observe Aircraft." Vandenberg, 1982. pp. 12-20.

Gaines, Olivia M. Tracking in Microwave Band 3. "Ground Crews Observe Aircraft," November, 1982, pp. 12-17.

Hudson, Hilda. Tomorrow Flight, and Weapons Fuel Cells. "The Future Crystal Computer Cost." 18, No. 1 (Winter, 1981), 12-17 and 19-20.

_____. Systems Integrate and Navy. Naval Review 1982 (Naval Center Naval Review Institute Publication, 1984, pp. 17-19.

Olsen, Jean A. The Field of Photonic Flow Meter. "Instruments in Engineering to Program Budgeting and Cost Analysis, Department of California to Lose Complex, June 2, 1981 to Attain Capacities Increase), pp. 1-13.

Orenstein, Donald H. The Flooding Physiological-Radiation System Monitors Carbon-14 Area-Dependence. Radio Instruments Review, Physicians, 1981, pp. 171-177.

Tate, Charles L. "Deployment Testing in the Chairmanship of Tactics," Combat Training 1980: Issue No 6. Naval Center Lectures in Dynamic Science, at the Universities at Callaghan (Berkeley, April 1-7, 1984, pp. 1-192.

"How the Budget Decisions are Reached," Armed Forces Management, April, 1963, p. 13.

McNamara, Robert S. "Managing the Department of Defense," Civil Service Journal, IV, No. 4 (April-June, 1964), 1-5.

Murray, Russell. "Systems Analysis and Cost Effectiveness," Defense Industry Bulletin, II, No. 9 (September, 1966), 33.

Quade, E. S. Military Systems Analysis. Santa Monica: The RAND Corporation, January, 1963, pp. 1-29.

_____. Systems Analysis Techniques for Planning-Programming-Budgeting. Santa Monica: The RAND Corporation, March, 1966, pp. 1-31.

Seligman, David. "McNamara's Management Revolution," Fortune, July, 1965, pp. 116-120 and 246-250.

U.S. Department of the Navy. Navy Comptroller Review, P-1360, XIV, No. 1 (March, 1967), 8-9.

"What Tying Dollars to Military Decisions Means to Defense Management," Armed Forces Management, IX (November 1962), 86-91.

Reports

U. S. Congress. Examination of the Department of Defense Cost Reduction Program. Report of the Subcommittee for Special Investigations of the Committee on Armed Services, 89th Cong., 2d Sess., September 12, 1966.

U.S. Department of Defense. Study Report on the Programming System for the Office of the Secretary of Defense. Prepared by the Office of the Assistant Secretary of Defense (Comptroller), June 25, 1962.

Speeches

Anderson, Herbert, Captain, USN, Office of the Chief of Naval Operations (Code OP 90B). Before the Navy Financial Management students, The George Washington University, November 30, 1966.

Enthoven, Alain C. "Choosing Strategies and Selecting Weapon Systems," before the Naval War College, Newport, R.I., June, 1963.

Hitch, Charles J. Remarks before the American Society of Military Comptrollers. Given at the Pentagon, Washington, D.C., September 21, 1961

_____. The Defense Budget as a Management Tool. Before the Annual Conference of the Armed Forces Management Association, Shoreham Hotel, Washington, D.C., March 1, 1963.

Holcomb, M. Stacer, LCdr, USN, Analyst in the Office of the Assistant Secretary of Defense (Systems Analysis). Before the Navy Financial Management class, The George Washington University, December 14, 1966.

Mogin, Bert, Office of the Secretary of Defense (Comptroller). Before the Navy Financial Management Students, The George Washington University, November 2, 1966.

Other Sources

McKinsey and Company, Inc., Memorandum to the Assistant Secretary of Defense (Comptroller), January 5, 1966.

U.S. Department of Defense. Personal interviews with a group of military and civilian personnel in the Office of the Secretary of Defense, March 8-9, 1967.

_____. Personal interview with an analyst, Office of the Assistant Secretary of Defense (Systems Analysis), March 8, 1967.

_____. Personal interview with LCdr. M. Stacer Holcomb, USN, Analyst, Office of the Assistant Secretary of Defense (Systems Analysis), November 39, 1966.

U.S. Department of the Navy. Files of the Office of Chief of Naval Operations, Systems Analysis (Code OP 96), March, 1967.

_____. Personal interview with a naval officer in the Office of the Chief of Naval Operations, March 8, 1967.

_____. Personal interview with Capt. Charles Woods, USN, Office of the Chief of Naval Operations, Code OP 96 (Systems Analysis), December 8-9, 1966.

_____. Personal interview with LCdr. Shelby Clark, SC, USN, OP-96 (Systems Analysis), Office of the Chief of Naval Operations, December 9, 1966.